INFORMATION PROVIDING SYSTEM, INFORMATION PROVIDING METHOD, AND CLIENT APPARATUS

Background of the Invention

5 1. Field of the Invention

     The present invention relates to an information providing system and an information providing method for acquiring various information provided by an information source server through a data communication

10 network, and a client apparatus (hereafter simply referred to as "client") for acquiring the various information provided by the information source server.

2. Description of the Related Art

     Associated with the developments of an

15 information processing technique and a communication technique, a client such as a computer terminal mounted in a typical house or an office or the like can easily read the information stored in an information source server installed on the Internet

20 through which various computer networks are connected to each other. In particular, a portable information apparatus such as an information terminal, a portable telephone, a personal handy-phone system (hereafter, abbreviated as PHS) or the like can carry out a

25 wireless data communication as a client to thereby access the information. A popularization of this portable information apparatus is remarkable. The

access to the information source server that stores
therein the various information and uses the portable
information apparatus as the client on the Internet is
conventionally done through a gateway (hereafter,
5   referred to as "GW").

Fig. 1 shows an example of a configuration of a
conventional information providing system, in order
that a client 10 acquires information provided by an
information source server 11 through a gateway
10 apparatus.   The client 10 such as a wireless portable
terminal in the conventional information providing
system and the like uses a GW apparatus 13 connected
through a data communication network 12 through which
a wire or wireless data communication with this
15 information source server 11 can be done, in order to
acquire various information stored in the information
source server 11 connected to the Internet.   The
client 10 is connected to this GW apparatus 13 through
a data communication network 14 through which the wire
20 or wireless data communication can be done.

In order to absorb differences of a security
manner of communication data, a band width and a
transmission delay amount between the data
communication network 12 and the data communication
25 network 14 and reduce a load on the data communication
network 12 as much as possible, the GW apparatus 13
has a cache memory 15, and transiently accumulates

therein the information from the information source
server 11 to which the client 10 requests an access.
That is, the GW apparatus 13, when receiving an
information access request from the client 10 through
5   the data communication network 14, acquires necessary
information from the information source server 11, and
converts it into a packet, and transiently accumulates
in the cache memory 15. Accordingly, when the client
10 again issues the information access request to the
10   same information source server 11, the GW apparatus 13
transfers the necessary information accumulated in the
cache memory 15 to the client 10 without any
connection to the information source server 11. Thus,
it is possible to omit a load caused by an unnecessary
15   data communication in the data communication network
12.

However, even in a case of information
unnecessary for the client 10 or its user, data is
transferred from the information source server 11
20   through the data communication network 12. Thus,
usage efficiencies of the data communication network
12 and the data communication network 14 are dropped.
Hence, this results in a useless consumption of a
capacity of the cache memory 15 in the GW apparatus 13.
25   So, the following troubles may be induced. For
example, such a fact that the client 10 frequently
accesses the information accumulated in the same

information source server imposes a load on the GW apparatus 13. Or, congestion or overload occurring in the data communication networks 12, 14 disables the information desired by an information provider

5 managing the information source server 11 to be not provided to the client 10 when it must be provided.

So, various techniques are proposed with regard to an information providing system which uses profile information implying attribute information indicative

10 of a display or process ability of the client 10 or preference information implying attribute information indicative of a selection standard or an idea of information necessary for the user of the client 10 and acquires the information necessary for the client

15 10 or its user at a minimum communication amount.

For example, Japanese Laid Open Patent Application (JP-A-Heisei, 11-55324) entitled "Communication System of Computer Network" discloses a technique with regard to an information providing

20 system intended to effectively use a resource necessary for an information transfer in an entire system in such a way that the agents, which are respectively mounted in advance in an information source server and a GW apparatus and a client,

25 exchange the profile information of various abilities, such as a band width of a data communication network, a size of a display screen and the like, with each

other.

Also, Japanese Laid Open Patent Application (JP-A-Heisei, 11-96099) entitled "Service Providing System" discloses a technique with regard to an information providing system, in which preference information composed of a taste of a user using a client, a usage history and the like is stored in a GW apparatus, and the GW apparatus, when receiving an information access request from the client, determines information to be provided to the client, in accordance with this preference information.

However, the technique disclosed in Japanese Laid Open Patent Application (JP-A-Heisei, 11-55324) has the following problem. That is, it can attain a dispersion of a load and an increase in an efficiency of the communication in the entire system due to a linkage process between the agents mounted in each of the information source server, the GW apparatus and the client. However, its application is difficult when the client is a portable terminal in which a miniaturization is required and a high process ability can not be desired, such as a portable telephone and PHS that are remarkably popularized in recent years. That is, a client having a low process ability owes a load caused by a linkage process between the agents and a communication process with the GW apparatus 13. Moreover, this is inconvenient for the user using the

client from the viewpoint of a communication cost.

Also, the technique disclosed in Japanese Laid Open Patent Application (JP-A-Heisei, 11-96099) has the following problem. That is, it can attain an

5   increase in an efficiency of the communication in the entire system by improving the probability in the taste of the information required by the user using the client in the GW apparatus. However, a communication process amount is not dropped so much

10 between the client and the GW apparatus. Similarly, the client having the low process ability has the problem from the viewpoint of the process load and the communication cost.

When the client having the low process ability

15 carries out a mobile communication, under a handoff control of a higher rank station managing the client, it is necessary to read a content of an accessed information source server as quickly as possible and remove an unnecessary electronic mail and content.

20 However, a process load associated with a communication process with the GW apparatus and the like causes a throughput of the mobile communication to be remarkably reduced.

25   **Summary of the Invention**

Therefore, an object of the present invention is to provide an information providing system and an

information providing method, which can attain an
increase in an efficiency of communication in
conjunction with acquirement of information which is
provided from an information source server to a client
5   apparatus having a low process ability, and provide
the client apparatus that can effectively acquire
various information provided by the information source
server even in the case of the low process ability.

To accomplish the above object, according to a
10   first aspect of the present invention, there is
provided a client apparatus, which includes a cache
memory, an accumulation judgment portion, a request
portion, a storage judgment portion and a control
portion.

15   The cache memory accumulates information
externally provided. The accumulation judgment
portion judges whether or not the information to be
externally provided is accumulated in the cache memory.
The request portion requests acquirement of
20   information when the accumulation judgment portion
judges that the information to be externally provided
is not accumulated in the cache memory. The
information processor, which processes either, one of
the information accumulated in the cache memory and
25   the information externally provided in response to the
request from the request portion. The storage
judgment portion judges whether or not the information

externally provided can be stored in the cache memory.
The information reduction portion reduces an amount of
the information accumulated in the cache memory based
on attribute information composed of preference

5   information indicative of a user and profile
information indicative of a process ability of the
client apparatus when the storage judgment portion
judges that the information externally provided can
not be stored in the cache memory. The control

10   portion controls the cache memory such that the
information externally provided in response to the
request from the request portion is stored after the
information reduction portion reduces the amount of
the information.

15   In the first aspect of the present invention,
the cache memory for accumulating the information
therein provided from the information source server is
equipped. If the acquirement of the information is
requested to the information source server, the

20   accumulation judgment portion judges whether or not
the information whose acquirement is requested is
accumulated in the cache memory. If it is judged that
the information is not accumulated, the acquirement is
firstly requested to the information source server.

25   The control portion controls the cache memory such
that the correspondingly acquired information in the
cache memory is stored therein after an increase of a

remaining capacity of the cache memory, based on the
attribute information composed of the preference
information of the user and the profile information
indicative of its process ability and the like.

5   To accomplish the above object, according to a
second aspect of the present invention, there is
provided an information providing system, which
includes an information source server which provides
information in response to a request, the client

10   apparatus according to the first aspect of the present
invention and a data communication network which
connects the client apparatus to the information
source server.

      In the above client apparatus, the cache memory

15   accumulates the information provided by the
information source server. The accumulation judgment
portion judges whether or not the information to be
provided by the information source server is
accumulated in the cache memory. The request portion

20   requests acquirement of the information to the
information source server through the data
communication network when the accumulation judgment
portion judges that the information to be provided by
the information source server is not accumulated. The

25   information processor processes either one of the
information accumulated in the cache memory and the
information provided by the information source server

in response to the request from the request portion.
Also, the storage judgment portion judges whether or
not the information provided by the information source
server can be stored in the cache memory.   The
5   information reduction portion reduces the amount of
the information accumulated in the cache memory based
on attribute information composed of preference
information of a user and profile information
indicative of a process ability of the client
10   apparatus when the storage judgment portion judges
that the information provided by the information
source server can not be stored in the cache memory.
The control portion controls the cache memory such
that the information provided by the information
15   source server in response to the request from the
request portion is stored after the information
reduction portion reduces the amount of the
information.

In the second aspect of the present invention,
20   the information providing system includes the
information source server for providing the
information and the client apparatus for requesting
the acquirement of the information to this information
source server.   In the client apparatus, the cache
25   memory for accumulating the acquirement information
from the information source server is provided.   So,
if the acquirement of the information is requested to

the information source server, the accumulation
judgment portion judges the presence or absence of the
accumulation of the information whose acquirement is
requested to the cache memory.   If it is judged that
5 the information is accumulated, the information
process is performed on this accumulated information.
On the other hand, if the accumulation judgment
portion judges that the information whose acquirement
is requested is not accumulated in the cache memory,
10 the acquirement is firstly requested through the data
communication network to the information source server.
Then, if the information is acquired correspondingly
to this acquirement request, the information process
is performed on this information.   Under controlling
15 of the control portion, an information newly acquired
from the information source server is stored in the
cache memory after reducing the amount of the
information provided by the information source server
and accumulated in the cache memory based on the
20 attribute information composed of the preference
information of the user and the profile information
indicative of its process ability and the like and
increasing a remaining amount of the cache memory.

In this information providing system according
25 to second aspect of the present invention, the data
communication network may be composed of a gateway
apparatus which is connected to the client apparatus

through a first data communication network and
connected to the information source server through a
second data communication network.

In this case, the gateway apparatus may include
5   a second request portion, a second cache memory and a
transfer portion.   The second request portion requests
acquirement of the information to the information
source server through the second data communication
network with the attribute information and
10 communication attribute information indicative of
communication abilities of the first data
communication network and the second data
communication network when the request of the request
portion of the client apparatus is received through
15 the first data communication network.   The second
cache memory accumulates the information provided by
the information source server in response to the
request from the second request portion.   The transfer
portion, which transfers the information accumulated
20 in the second cache memory to the client apparatus
through the first data communication network based on
the attribute information and the communication
attribute information.

In this information providing system, the
25 gateway apparatus is inserted between the client
apparatus and the information source server so that
the information can be sent and received through the

first data communication network and the second data
communication network, respectively. This gateway
apparatus once receives the acquirement request of the
information to the information source server from the
5 client apparatus, then, the second request portion
requests the acquirement of the information whose
acquirement is requested to the information source
server, based on the attribute information and the
communication attribute information indicative of the
10 communication abilities of the first data
communication network and the second data
communication network. So, if the information is
acquired from the information source server in
response to this acquirement request, it is
15 accumulated in the second cache memory. Moreover, the
information accumulated in the second cache memory is
transferred through the first data communication
network to the client apparatus, based on the
attribute information and the communication attribute
20 information.

To accomplish the above object, according to a
third aspect of the present invention, there is
provided an information providing method, which
includes the steps of (1) providing an information
25 source server and a client apparatus, (2) accumulating
information provided by the information source server
in a cache memory, (3) judging whether or not the

information to be provided by the information source
server is accumulated in the cache memory, (4)
requesting acquirement of the information to the
information source server when the judging step (3)

5   judges that the information to be provided by the
information source server is not accumulated in the
cache memory, and (5) processing either one of the
information accumulated in the cache memory and the
information provided by the information source server

10 in response to the request.

This third aspect of the present invention may
further include the steps of (6) judging whether or
not the information provided by the information source
server can be stored in the cache memory, (7) reducing

15 the amount of the information accumulated in the cache
memory based on attribute information composed of
preference information of a user and profile
information indicative of a process ability of the
client apparatus when the judging step (6) judges that

20 the information provided by the information source
server can not be stored in the cache memory and (8)
controlling the cache memory such that the information
provided by the information source server in response
to the request is stored after the amount of the

25 information is reduced by the reducing step.

In the third aspect of the present invention, it
is judged whether or not the information whose

acquirement is requested to the information source
server from the client apparatus is accumulated in the
cache memory for accumulating therein the information
already acquired from the information source server in
5 advance. If it is judged that the information is not
accumulated, the acquirement of the information is
requested through the data communication network to
the information source server. So, the information
source server provides the information whose
10 acquirement is requested. In accordance with the
attribute information composed of the preference
information of the user and the profile information
indicative of its process ability and the like, the
client apparatus increases a remaining capacity of the
15 cache memory, and then stores the information provided
by the information source server in the cache memory.

     This third aspect of the present invention may
further include the steps of (9) providing a gateway
apparatus which is connected to the client apparatus
20 through a first data communication network and
connected to the information source server through a
second data communication network, (10) requesting
acquirement of the information to the information
source server through the second data communication
25 network with the attribute information and
communication attribute information indicative of
communication abilities of the first data

communication network and the second data
communication network when the request of the
requesting step (4) is received through the first data
communication network, (11) accumulating the
5   information provided by the information source server
into a second cache memory in response to the request
in the requesting step (10) and (12) transferring the
information accumulated in the second cache memory to
the client apparatus through the first data
10   communication network based on the attribute
information and the communication attribute
information.

In the third aspect of the present invention, it
is judged whether or not the information whose
15   acquirement is requested to the information source
server from the client apparatus is accumulated in the
cache memory for accumulating therein the already
acquired information provided by the information
source server in advance. If it is judged that the
20   information is not accumulated, the acquirement of the
information is requested through the first data
communication network to the information source server.
The gateway apparatus receives the acquirement request.
In accordance with the attribute information composed
25   of the preference information of the user and the
profile information indicative of the process ability
of the client apparatus and the like and the

communication attribute information indicative of the communication abilities of the first data communication network and the second data communication network to the information source server, this gateway apparatus requests the acquirement of the information whose acquirement is requested by the client apparatus through the second data communication network to the information source server. The information source server provides the information whose acquirement is requested. The gateway apparatus accumulates therein this provided information. Moreover, the gateway apparatus transfers this accumulated information through the first data communication network to the client apparatus based on the attribute information and the communication attribute information. The client apparatus increases a remaining capacity of the cache memory, based on the attribute information, and then stores the information provided by the information source server in the cache memory.

Brief Description of the Drawings

Fig. 1 is a configuration view showing an example of a configuration of a conventionally proposed information providing system;

Fig. 2 is a configuration view showing a schematic configuration of an information providing

system according to a first embodiment of the present invention;

Fig. 3 is a sequence diagram schematically showing a series of information acquiring sequences of 5 the information providing system according to the first embodiment of the present invention;

Fig. 4 is an explanation view showing a schematic configuration of memory information in a cache memory of a client in the first embodiment of 10 the present invention;

Fig. 5 is a flowchart showing an example of a process content of an information source server access process of the client in the first embodiment of the present invention;

15 Fig. 6 is an explanation view conceptually showing a manner when information received from the information source server is accumulated in the cache memory of the client in the first embodiment of the present invention;

20 Figs. 7A to 7C are explanation views showing examples of a screen image displayed on a display of the client in the first embodiment of the present invention;

Fig. 8 is a flowchart showing an example of a 25 process for reconfiguring the memory information in the cache memory of the client in the first embodiment of the present invention;

Fig. 9 is an explanation view conceptually showing an example of a manner when the information received from the information source server is stored in the cache memory of the client in the first

5   embodiment of the present invention;

Fig. 10 is an explanation view conceptually showing another example of the manner when the information received from the information source server is stored in the cache memory of the client in

10   the first embodiment of the present invention;

Fig. 11 is an explanation view conceptually showing an example of a manner when the information received from the information source server is compressed in the cache memory of the client in the

15   first embodiment of the present invention; and

Fig. 12 is a configuration view showing a schematic configuration of an information providing system in a second embodiment of the present invention.

20   **Description of the Preferred Embodiment**

An information providing system, an information providing method and a client according to embodiments of the present invention will be described below with reference to drawings.

25   (First Embodiment)

Fig. 2 shows a schematic configuration of an information providing system according to a first

embodiment of the present invention.   In this
information providing system, a client 20 such as a
personal computer, a portable telephone or the like,
in order to access various information stored in an
5   information source server 21 connected to the Internet,
uses a GW apparatus 23 connected to this information
source server 21 through a data communication network
22 through which a wire or wireless data communication
can be done.   The client 20 is connected to this GW
10   apparatus 23 through a data communication network 24
through which a wire or wireless data communication
can be done.

In order to absorb differences of a security
manner of a communication data, a band width and a
15   transmission delay amount between the data
communication networks 22 and the data communication
network 24 and reduce a load on the data communication
network 22 as much as possible, the GW apparatus 23
has a cache memory 25, and transiently accumulates
20   therein the information from the information source
server 21 to which the client 20 requests an access.

The client 20 also has a cache memory 26, and
tries to re-use previously acquired information
(hereafter, referred to as "acquirement information")
25   in order to effectively use a communication resource.
Moreover, the client 20 stores therein attribute
information 27 composed of profile information and

preference information, and re-configures the acquirement information accumulated in the cache memory 26 based on this attribute information 27. Thus, it is possible to provide information optimal

5   for a user of the client.

The above-mentioned client 20 and the GW apparatus 23 respectively have a central processing unit (hereafter, abbreviated as CPU) (not shown), and can execute various controls in accordance with

10 programs stored in predetermined memories such as a read only memory (ROM) and the like.

In the GW apparatus 23, an agent program 28 is stored in the predetermined memory, and suitably read out and executed by the CPU. The agent program 28

15 performs a control for changing information to be provided to the client 20, in accordance with a profile attribute of the client 20 sent by the client 20, communication attribute information of the data communication networks 22, 24, and a preference

20 attribute of the user of the client 20.

The profile attributes of the client 20, for example, includes a capacity of a reception buffer of the client 20, its store remaining amount, a size of a display region, the number of bits for a display color,

25 a battery remaining amount, an input manner and a processing ability. They are based on the CC/PP (Composite Capability/Preference Profile)

specification defined by the World Wide Web Consortium (W3C) and the UAPROF (User Agent Profile) specification considered by the wireless application protocol forum (WAP Forum).

5   The communication attribute information of the data communication networks 22, 24, for example, includes transmission capacities of the data communication networks 22, 24, transmission delay amounts thereof and a transmission/reception profile

10   such as a specification of half duplex or full duplex, a transmission/reception timing or the like.

      The preference attribute of the user of the client 20, in order to represent a taste and a favorite of the user, for example, includes a kind and

15   an access frequency of the information source server 21, an automatic process for defining an access timing and a access round of an information source server, and a filtering indication for indicating information to be cut out in accordance with a priority for the

20   information and the like.   Similarly, they are based on the above-mentioned specifications.   The user of the client 20 can suitably change the profile attribute, the communication attribute information and the preference attribute.

25   Fig. 3 schematically shows a series of information acquiring sequences of the information providing system in the first embodiment as mentioned

above.   The client 20, when receiving an address to specify an information source server 21 to be accessed from a user, sends a content request 30 including the received address through the data communication

5   network 24 to the GW apparatus 23.   The GW apparatus 23 stores this content request in the cache memory 25, and sends a content request 31 through the data communication network 22 to the information source server 21 to which the access is requested.   At this

10   time, in accordance with the profile attribute, the preference attribute and the communication attribute information of the data communication network, the GW apparatus 23 requests the information source server 21 to acquire the information such that a load on the

15   data communication network is reduced by performing, for example, the access round on the information source server 21, and it becomes efficient for the communication ability of the client.

        The information source server 21, in which the

20   various contents are stored in advance, takes out a content which is requested to be acquired by the received content request 31, and returns it as a content 32 to the GW apparatus 23.

        The GW apparatus 23, when receiving the content

25   32, stores it in the cache memory 25 as a content 32 made into the packet (Store 33), correspondingly to the content request 30 stored in the cache memory 25,

prior to the reception.   The GW apparatus 23 carries

out a filtering process 34 by using the agent program

28, based on the preliminarily stored profile

attribute information of the client 20, the

5   communication attribute information of the data

communication networks 22, 24 and the preference

attribute information, and changes the content stored

in the cache memory 25 to the information to be

provided to the client 20.   For example, in accordance

10   with the process ability and the display ability of

the client 20 and the taste of the user of the client

20, the GW apparatus 23 carries out the effective

information provisions, such as a change of an

information amount with color picture information as

15   picture information corresponding to white/black

picture information, a change of a quality of

information with high quality picture information as

low quality picture information, a change of a timing

of information to be sent and the like.   The

20   information filtered on the basis of the agent program

28 in the GW apparatus 23 as mentioned above is sent

as a content 35 to the client 20.

In the information providing system in the first

embodiment of the present invention, the client 20 can

25   further display the information received from the GW

apparatus 23, for example, on a display (not shown),

in a condition optimal for the user of the client, in

accordance with the attribute information 27 composed of the profile information and the preference information. The client 20 that can carry out such a control will be described below.

5   In order to re-use the information such as the content received from the GW apparatus 23 and the like, the client 20 stores relation information such as an identifier of the information source server 21 and the like together with this received information, in the cache memory 26, and then retrieves this stored information every time the access to the information source server is occurred.

       Fig. 4 shows the schematic configuration of the memory information of the above-mentioned cache memory 26. The cache memory 26 of the client 20, as an identifier of the information source server 21, stores therein information capacity 41 representing capacity of a reception information when the GW apparatus 23 previously accessed an information source server pointed out by a URL (Uniform Resource Locators) 40, correspondingly to the URL, for example, to be used on the Internet, an information kind 42 to identify figure information, character information or acoustic information, and its reception information 43.

25   Fig. 5 shows an example of a process content of an information source server access process that is stored in a predetermined memory and processed by a

CPU (not shown) in the client 20. That is, the client 20 monitors acquirement request i.e. a content request from the user to a content stored in a predetermined information source server on the Internet (Step S50 :

5 NO). If this content request is detected as an indication of an information source server of a request destination identified by the URL (Step S50 : YES), the cache memory 26 is firstly accessed to refer to a previous access history.

10   That is, the client 20 accesses the cache memory 26, and performs collation by using a indicated URL as a retrieval key, and accordingly judges whether or not there is a content that was previously acquired by the same information source server and is identical to a

15 content requested by the user at this time (Step S51). If it is judged that there is a coincident retrieval key as the collation result of the retrieval key (Step S52 : YES), information stored correspondingly to the URL used as the retrieval key is taken out from the

20 cache memory and recovered (Step S53). On the other hand, if it is judged that there is not the coincident retrieval key as the collation result of the retrieval key (Step S52 : NO), a communication processor (not shown) carries out a communication connection through

25 the data communication network 24 to the GW apparatus 23, and receives the content whose acquirement is requested from the information source server

corresponding to the indicated URL (Step S54).

If the requested content is acquired from the cache memory 26 or the information source server as mentioned above, a configuration within the cache
5 memory 26 is re-configured (Step S55). That is, the information to be accumulated in the cache memory 26 is arranged so as to provide the information optimal for the client 20 or its user, based on the profile information and the preference information stored in
10 advance as the attribute information 27. After that, the predetermined information processes, such as a picture process, a display process and the like, are performed on the content acquired at the step S53 or S54 (Step S56). Then, the series of processes is
15 ended (Return).

The above-mentioned control for re-configuring the information accumulated in the cache memory 26 of the client 20 will be described below after the explanation of the information to be accumulated in
20 the cache memory 26.

Fig. 6 conceptually shows the manner when the information received from the information source server 21 is accumulated in the cache memory 26 of the client 20. Here, information 70 to 76 indicate the
25 respective information which are displayed on a display (not shown) of the client 20 and on which a predetermined receiving process is performed. An

information amount is represented by a size of a
figure.   For example, it indicates that an information
amount of the information 71 is greater than that of
the information 73.   Here, when each information is
5   defined as menu data corresponding to one screen on
the display (not shown) of the client 20, each
information is correlated and linked to other
information corresponding to one screen corresponding
to a selection item of a menu screen.   This link is
10   denoted by an arrow for coupling each information, and
a direction of the arrow is defined as a transition
direction.

If the information 70 is assumed to be an
initial menu data when a power supply of the client 20
15   is turned on or when the client 20 is initialized, the
information 71 is menu data correlated by a link 80,
correspondingly to one selection item on a menu screen
based on the information 70.   Moreover, the
information 73 is menu data correlated by a link 81,
20   correspondingly to one selection item on a menu screen
based on the information 71.

Figs. 7A, 7B and 7C show examples of screen
images displayed on the display (not shown) of the
client 20.   Fig. 7A shows an image of an initial menu
25   screen displayed based on the information 70.   Fig. 7B
shows an image of a portal site screen displayed based
on the information 71.   Also, Fig. 7C shows an image

of a service screen displayed based on the information 73. When the power supply of the client 20 is turned on or when it is initialized, the initial menu screen shown in Fig. 7A is displayed based on the information

5   70. Here, when a selection item "2. INFORMATION" is selected by using a cursor, the menu screen based on the information 71 correlated to it by the link 80 is displayed as shown in Fig. 7B. Moreover, when a selection item "3. INFORMATION AROUND STATION" is

10   selected by using the cursor, the menu screen based on the information 73 correlated to it by the link 81 is displayed as shown in Fig. 7C.

     The client 20 stores in advance the information 70, which is the initial menu data, in a non-volatile

15   memory. So, the information of the menu screen selected by the user from the display screen of this initial menu data is sequentially acquired from the information source server. Thus, the client 20 can reduce the information amount to be stored to a

20   minimum and always acquire the newest information that is changed occasionally and momentarily. At this time, the client 20 can avoid the re-access to the previously acquired menu data by accumulating as much as possible the menu data acquired for each selection

25   from each menu screen, in the cache memory 26. Here, if an accumulation capacity of the cache memory 26 is within a dashed line range 85 of Fig. 6, the

information 76 can not be accumulated. Hence, if the access to the information 76 is again done, it is necessary to connect through the data communication network 24 to the information source server.

5   The capacity of the cache memory 26 of the client 20 is limited as mentioned above. Thus, in the client 20 in the first embodiment of the present invention, the contents, which were previously accessed and accumulated in the cache memory 26, are

10   suitably re-configured so as to effectively accumulate the information necessary for the client 20 or the user of the client 20, based on the attribute information 27.

        Fig. 8 shows an example of a process for re-

15   configuring the memory information in the cache memory 26 of the client 20 shown at the step S55 of Fig. 5. The client 20 firstly analyzes the profile information of the client 20 and the preference information of the user of the client 20 stored in advance as the

20   attribute information 27 (Step S90).

        That is, if the content is re-used at the step S53 of Fig. 5, the access frequency is updated, or a content is newly acquired at the step S54. Thus, a relation between information to be newly stored and

25   information already stored in the cache memory 26 is analyzed based on the updated preference information and profile information. Then, a priority is added,

or compressible accumulation information is retrieved,
or removable accumulation information is retrieved.
For example, a priority is added so as to store new
reception information instead of accumulation
5   information having a low access frequency. If its
priority is low, a picture quality of picture
information or a tone quality of acoustic information
is dropped by referring to the profile information.
Accordingly, it is possible to compress the
10 accumulation information.

Also, if a unit of information accumulated in
the cache memory 26 is menu data corresponding to one
screen in the display (not shown) of the client 20, it
is correlated to information corresponding to the
15 screen corresponding to a selection item in each menu
screen.   The correlation between the respective
information is changed by the re-configuration of the
memory information.   The correlation is an important
element for determining the priority to be added at
20 the time of the above-mentioned analysis and the
removal possibility.

As an analyzed result of such attribute
information 27, if it is judged that the information
to be updated can be stored in the cache memory 26
25 (Step S91 : YES), the priority added based on the
analysis is firstly referred to.   If the priority is
higher than that of certain information (Step S92 :

YES), information of a lower priority is removed from
the cache memory 26 (Step S93). Then, new information
to be newly updated is stored in the cache memory 26
(Step S94). Then, a series of processes is ended
5 (End).

     Fig. 9 conceptually shows an example of the
manner performed at the steps S92, 93 when the
information received from the information source
server 21 is stored in the cache memory 26 of the
10 client 20. If it is judged that the acquirement of
the information 76 is higher in priority than that of
the information 73 based on the taste of the user as
the analyzed result of the preference information
among the attribute information 27, the information 73
15 is removed from the cache memory 26, and the
information 76 is stored instead of it. After that, a
link 101 is established between the information 76 and
the information 72 already correlated to the
information 70 by a link 100, and the link to the
20 removed information 73 is deleted.

     Fig. 10 conceptually shows another example of
the manner performed at the steps S92, 93 when the
information received from the information source
server 21 is stored in the cache memory 26 of the
25 client 20. If it is judged that the acquirement of an
information 110 is higher in priority than that of the
information 76 based on the taste of the user as the

analyzed result of the preference information among
the attribute information 27, a link 111 to return to
the information 70 is generated instead of the link
101 to the information 76. The information 76 is
5 removed from the cache memory 26, and the information
110 is stored. After that, a link 112 is established
between the information 110 and the information 71
already correlated to the information 70 by the link
80.

10   By returning to Fig. 8, the explanation is
continued. At the step S92, as the analyzed result of
the attribute information 27, if the added priority is
lower than that of other information (Step S92 : NO),
in accordance with the profile information of the
15 client 20, by referring to the information kind and
the information capacity correlated to the
accumulation information as shown in Fig. 4, it is
judged whether or not there is a component which can
compress by dropping the picture quality of the
20 picture information or the tone quality of the
acoustic information in the already stored
accumulation information (Step S95). At this Step S95,
if it is judged that there is the compressible
component (Step S95 : YES), the accumulation
25 information is compressed, for example, by changing
the picture quality and/or the size of the picture
information and/or dropping the tone quality of the

acoustic information (Step S96).   After that, new
information to be newly updated is stored in the cache
memory 26 (Step S94).   Then, the series of processes
is ended (End).

5   Fig. 11 conceptually shows an example of the
manner when the information received from the
information source server 21 is compressed in the
cache memory 26 of the client 20 at the step S96.
That is, by referring to the information kind and the
10   information capacity correlated to the accumulation
information as shown in Fig. 4 among the information
already accumulated in the cache memory 26, if it is
judged that the information 71 is the compressible
information, for example, if the client 20 includes
15   picture information of a color picture although the
client 20 has only a display performance of a
white/black picture, the information 71 is compressed
into information 120 by carrying out a subtractive
color process of the color picture, or changing the
20   picture quality itself or a size, or dropping the tone
quality of the acoustic information.   Then, a link 121
from the information 70 and links 122, 123 to the
information 73, 74 are again generated, which
increases a memory region for new information in the
25   cache memory 26.

Again, by returning to Fig. 8, the explanation
is continued.   If it is judged at the step S95 that

there is no compressible information (Step S95 : NO),
it is then judged whether or not there is information
that can be removed based on the access frequency of
the preference information and the profile information
5 of the client 20 and the like (Step S97).   If there is
the removable information (Step S97 : YES), its
information is removed (Step S98).   Then, new
information to be newly updated is stored in the cache
memory 26 (Step S94).   Then, the series of processes
10 is ended (End).

On the other hand, as the analyzed result of the
attribute information 27 at the step S91, if it is
judged that the information to be updated can not be
stored in the cache memory 26 (Step S91 : NO), or if
15 it is judged that there is not the information which
can be removed at the step S97 (Step S97 : NO), the
series of processes is directly ended (End).   In this
case, it is necessary that the information to be newly
stored is acquired through the data communication
20 network 24 from the information source server, even if
a re-access is tried.

As mentioned above, in the information providing
system according to the first embodiment of the
present invention, the client 20 requesting the
25 acquirement of the various information stored in the
information source server 21 receives, through the GW
apparatus 23, the acquisition information from the

information source server 21 transiently stored in the
cache memory 25 based on the agent program 28 of this
GW apparatus 23, in accordance with the profile
information of the client 20, the preference

5   information of its user and the communication
attribute information of the data communication
network, while effectively using the data
communication network by automatically making a round
and periodically acquiring. The client 20 stores the

10 reception information from the GW apparatus 23 in the
cache memory 26, and again configures the accumulation
information for each access by considering the
relation to the stored information based on the
attribute information 27. Thus, it is possible to

15 omit the useless usage of the communication network
and also possible to provide an operation menu that is
easy for the client 20 and the user of the client 20
to access even if it is not connected to the data
communication network. Moreover, the capacity of the

20 cache memory 26 of the client 20 can be effectively
used, which can reduce the capacity of the cache
memory to a minimum and can attain a low consumptive
power and a miniaturization and further improve the
portability.

25 (Second Embodiment)

        The information providing system according to
the first embodiment of the present invention is

designed such that the GW apparatus 23 acquires the
information requested by the client 20 from the
information source server 21 at the optimal
communication amount, in accordance with the
5   preference information, the profile information and
the communication attribute information. However, it
is not limited to that configuration. In an
information providing system according to a second
embodiment of the present invention, the client 20
10   reports the preference information, the profile
information and the communication attribute
information to the information source server. Then,
the information source server sends store information
whose acquirement is requested by the client to the GW
15   apparatus 23, in accordance with those attribute
information.

         Fig. 12 shows a schematic configuration of the
information providing system according to the second
embodiment of the present invention. In the
20   information providing system shown in Fig. 12, the
same symbols are given to the same portions as the
information providing system according to the first
embodiment of the present invention shown in Fig. 2,
and their explanations are omitted. The information
25   providing system in the second embodiment differs from
that of the first embodiment in that an information
source server 130 for storing therein information

whose acquirement is requested by the client 20 stores
therein attribute information 131 which is sent by
this client 20 and similar to the attribute
information 27, and an information provider can
5   effectively provide the information at a transmission
timing, a quality and an information amount optimal
for a taste of a user, a display ability and a process
ability of the client, in accordance with this
attribute information 131.

10   In this case, the side of the information
provider can total various tendencies required to
effectively provide the information of the process
ability and the display ability of the client using
the information providing service and the taste of the
15   user.   For example, this enables not only a grasp of
advertisement effect but also an information providing
service in which the information provider reports to a
sponsor the time close to an actual time of the
advertisement effect and it is not attained in the
20   conventional technique.   Thus, for example, the
sponsor can analyze its advertisement effect to
thereby determine the most effective advertisement
method.

      It should be noted that, in the first and second
25   embodiments, the profile information and the
preference information are set in advance for the
client.   Thus, it is possible to reduce an economic

burden on the user and a load on the communication

network.   For example, information optimal for a buyer

can be acquired quickly and effectively by selling a

client in which a manufacture defines attribute

5   information of a combination of preference information

and profile information preliminarily determined in

accordance with a usage tendency of a user such as

"Setting As Business Terminal" or "Setting As Terminal

For Sports Fan".   Moreover, a client convenient for a

10   user can be provided by selling the attribute

information itself corresponding to this usage

tendency and enabling the user to set it to the client.

Moreover, it is possible to introduce a feature in

order to enlarge a sales network of the client.

15   Moreover, in the first and second embodiments,

it is desirable to perform a proper encryption and a

user verification on the profile information of the

client and the preference information of the user,

from the viewpoint of privacy, when those attribute

20   information are disclosed for the communication

network, the GW apparatus and the information source

server.

Furthermore, the information providing system

according to those embodiments is configured such that

25   the client is connected to only one information source

server through the wireless data communication network.

However, it is not limited to this configuration.   So,

the similar effect can be attained even in a case of a
connection in which a plurality of information source
servers can access such as the Internet.   Also, the
similar effect can be attained even in a case that the
5 client and the GW apparatus are integrated into a
single device.

Furthermore, not only the client in the first
embodiment but also the user itself of the client in
the second embodiment can indicate the priority of the
10 particular preference information or transiently
operate the profile information to thereby improve the
efficiency of acquiring the information from the
information source server.   Moreover, by reporting
this indicated attribute information to the GW
15 apparatus and the information source server at any
time, the data communication network can be
effectively used between those respective apparatuses.
Also, the above-mentioned dynamic switching between
the attribute information enables the optimal
20 acquirement of the information even if the client is
changed depending on the purpose of the user.   Thus,
this implies the effective usage of the information
source server.

As mentioned above, according to the present
25 invention, the useless usage of the communication
network is omitted and even if it is not connected to
the data communication network, the information

convenient for the client apparatus and its user can be provided.

Also, according to the present invention is composed such that the gateway apparatus is inserted between the information source server and the client apparatus, and the information provided by the information source server is acquired and transferred based on the communication attribute information of the first and second data communication networks between the client apparatus and the information source server and the attribute information through this gateway apparatus. Thus, it is possible to make each data communication network effective and reduce the load of the client apparatus. Hence, even if the process ability of the client apparatus is low, it is possible to provide the client apparatus convenient for the user.

Moreover, according to the present invention, the side of the information provision can total the various tendencies required to effectively provide the information of the process ability and the display ability of the client apparatus using the information providing service and the taste of the user. For example, this enables not only the grasp of the advertisement effect but also the information providing service in which the information provider reports to the sponsor the time close to the actual

time of the advertisement. Thus, the sponsor can analyze its advertisement effect to thereby determine the most effective advertisement method.

Moreover, according to the present invention,
5   the client apparatus can dynamically change the respective attribute information. Thus, for example, the client apparatus can transiently operate the profile information or the communication attribute information to thereby improve the efficiency of
10 acquiring the information from the information source server. Moreover, if this changed attribute information is suitably reported to the gateway apparatus or the information source server, the first and second data communication networks or the data
15 communication networks can be effectively used between those respective apparatuses. Also, the above-mentioned dynamic switching between the attribute information enables the optimal information to be acquired even if the client apparatus is changed
20 depending on the purpose of the user of the client apparatus. Thus, this implies the effective usage of the information source server.

Moreover, according to the present invention, the capacity of the cache memory of the client
25 apparatus can be effectively used to thereby reduce its capacity to a minimum and attain the low consumptive power and the miniaturization and

accordingly improve the portability.

Moreover, according to the present invention, it can be applied to a WAP system.

m   Moreover, according to the present invention, by
5   carrying out the particular setting, for example, such as "Setting As Business Terminal" or "Setting As Terminal For Sports Fan", the user suitable for this setting can acquire the information of the content at the optimal condition immediately after the start of
10   the usage and the like.   Hence, it is possible to reduce the economic burden on the user and the load on the communication network.

Moreover, according to the present invention, it is possible to provide the client apparatus convenient
15   for the user of the client apparatus and also possible to introduce the feature in order to enlarge the sales network of the client apparatus.